Suicide mortality in Italy from 1980 to 2002

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A B S T R A C T

The aim of this study is to update age and sex mortality rates for suicide in Italy; to evaluate the methods of suicide; to consider the effect of under-reporting on mortality rate for suicide; to compare age-adjusted mortality rates for suicide; and to examine some possible causes for the misclassification of suicide. Temporal trends, from 1980 to 2002, were analyzed using joinpoint regression. Suicide rates decreased from 1980 to 2002 by 10.5% for men and by 44% for women. The change in suicide methods indicated an increasing use of highly lethal methods. The under-reporting of suicide seems to have no effect on temporal changes in mortality rates or on the geographical distribution. These data indicate that Italy is a country at low risk for suicide.

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1. Introduction

Suicide is among the 10 leading causes of death in most countries. About 877,000 people committed suicide around the world in the year 2002, giving a mortality rate of 16 per 100,000 people per year, and the figure may double for the year 2020 (Bertolote and Fleischmann, 2005). In Europe, the suicide rate declined in the period 1980–1999 in most countries but not in the former Soviet Union countries (Levi et al., 2003). In the late 1990s, the differences in suicide rates between European countries were more than 10-fold with the highest suicide rates in Lithuania and the Russian Federation (about 60–70 per 100,000 inhabitants per year among men and about 10 among women) and the lowest in Greece (<5 per 100,000 among men and <1 among women) (Levi et al., 2003).

The changes reported in Europe in recent decades have not been homogeneous by sex and age groups. In most industrialized countries, rates of suicide for young males have increased, while they have declined substantially in women and older men, although some industrialized countries have also experienced an increase in suicide rates for young females (Gunnell et al., 2003; Rutz and Wasserman, 2004; Wasserman et al., 2005; Shah et al., 2008). However, a statistically significant decline among young men was observed at the beginning of 21st century, for some European countries (Biddle et al., 2008; Stark et al., 2008; Värnik et al., 2009).

There are many explanations for the changes observed in suicide rates reported in Europe (and elsewhere). The differences in age and

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sparing the family from shame, guilt and stigma and/or in order to facilitate the payment of insurance benefits to his/her family (Phillips and Ruth, 1993).

In cases of “violent death” in Italy, the death certificate is corroborated by a mandatory investigation by police authorities, but a medico-legal examination is not routinely performed except in cases open to debate. A judicial autopsy can be ordered by a judge (an Assistant Public Prosecutor). The decision to order a medico-legal autopsy is based on the following factors: (1) the preliminary information from the judicial police, (2) the certificate of death (provided by the first doctor who reached the place of death), (3) the findings from the medico-legal site survey, if any, and (4) the information given to the judge by the victim’s family members or by third parties (Council of Europe, 2000).

For these reasons, it is important to take into account deaths officially classified as “accidents” because such deaths, especially by poisoning, may well be masked suicides. Therefore, temporal trends and the geographical distribution of suicides may be affected by these accidental deaths, which possibly should have been classified as suicides.

The aims of the present study were as follows: (a) to update age and sex mortality rates for suicide to 2002 in Italy; (b) to evaluate the methods used for suicide for the period 1980–2002; and (c) to consider the effect of under-reporting on the mortality rate for suicide.

2. Methods

Mortality data come from the Italian Mortality Database that is collected by the Italian National Census Bureau (ISTAT) and processed by the Statistics Unit of the National Institute of Health (Istituto Superiore di Sanità). ISTAT collects all death certificates of Italian citizens who die in Italy and codes the initial causes of death according to the ninth revision of the International Classification of Diseases (ICD–9) (World Health Organization, 1987). At CNESPS, the personal data and initial causes of death are gathered in a database that allows the calculation of specific-cause mortality rates. Deaths for suicide are coded under External Causes, labeled E950–E959. All the analyses, if not otherwise specified, were conducted on people aged 15 years and over. The age-adjusted Italian annual mortality rates for suicide were calculated from 1980 to 2002, the last year with available data. Separate analyses were also conducted for the following age-groups: 15–24, 25–44, 45–64 and 65+ years. All the rates were age-adjusted using the Italian population of the 1991 census as a reference, and the analyses were performed separately for men and women. Rates are per 100,000 individuals per year.

An analysis of temporal trends was performed using jointpoint regression analysis, which allows the identification of the calendar years where the temporal trend changed significantly. The best fitting point (“jointpoint”), where the rate significantly changes (increases or decreases), is chosen. The analysis starts with the minimum number of jointpoints (a zero joinpoint, which is a straight line) and tests whether one or more jointpoints are significant and must be added to the model (a maximum of 3 jointpoints were allowed). In the final model, each jointpoint (if any were detected) indicates a significant change in the slope. An estimated Annual Percentage Change (APC) and the corresponding 95% confidence interval (CI) was then computed for each detected trend by fitting a regression line to the natural logarithm of the rates, using calendar years as the regressor variable \( \ln(\text{rate}) = a + bx \), where \( x \) is the calendar year; the APC is estimated as \( 100(10^{-b} - 1) \). The APC was considered significant if the confidence interval did not include zero. The jointpoint analysis was applied to the age-adjusted rates (and their standard errors), separately for each sex-by-age group.

Differences by gender and by age in the methods used for suicide (the individual codes of ICD9 included between E950 and E959) for the entire study period (1980–2002) were evaluated using chi-square test \( \chi^2 \).

An analysis of temporal trends in the rates of suicide by method was also performed using jointpoint regression analysis. The jointpoint analysis was applied to the age-adjusted rates (and their standard errors) as described before. Models were estimated for each method of suicide, separately for men and women, for people aged 15 years and over and for the age classes 15–24, 25–44, 45–64 and 65+. In order to compare the estimated changes in method of suicide during the period 1980–2002, the Average Annual Percentage Change (AAPC) was calculated separately for each age class. The AAPC is a summary measure that is computed, over a fixed interval, as a weighted average of the slope coefficients of the jointpoint regression with the weights equal to the length of each detected segment over the interval. When no jointpoint is detected, the AAPC coincides with the APC. The jointpoint analysis and the AAPC were not conducted for the very rare methods of suicide.

With respect to the possible underestimate of suicide mortality in Italy, the mortality rates for selected accidental deaths that involved the same methods as suicides (see Table 1) were calculated for the period 1980–2002. Furthermore, “underestimated” deaths by poisoning (cases which, after the legal investigation, could not be classified an accident, suicide or homicide) were analyzed, and the mortality rates for “underestimated” poisoning (by drugs E980.0–E980.5; by other chemical substances E980.6–E980.9; and by carbon monoxide E982.0–E982.1) were calculated. Trends for the period 1980–2002 for the selected accidental and for “underestimated” poisoning deaths were analyzed by jointpoint regression analysis (as described before).

In order to compare the geographical distribution of accidental deaths and suicides in the three macro-areas of Italy (North [N], Central [C] and South-Islands [S-I]), standardized mortality ratios (SMR) were calculated for the period 1980–2002 using the South-Islands age-specific mortality rates as a reference; 95% Cs were calculated using the Byar formula (Rothman, 2002).

The jointpoint analysis was applied using the Joinpoint Regression Program, Version 3.3, from the Statistical Research and Applications Branch of the National Cancer Institute (National Cancer Institute, 2005; Kim et al., 2000). SMRs and 95% Cs were calculated using Microsoft Office Excel 2003. All other statistical analysis were performed using SPSS for PC, version 15.0.

3. Results

During the period 1980–2002, about 4000 deaths by suicide among Italian residents were certified each year in Italy. The mortality rate for suicide in men declined from 11.4 in 1980 to 10.2 in 2002 (from 13.7 to 12.2 based on the population 15 years old and over), while in women the rates for the same years declined from 5.0 to 2.8 (from 5.9 to 3.3 for those 15 years old and over), a decrease of about 11% in men and 44% in women, respectively (Fig. 1). The male/female suicide ratio increased from 2.3 in 1980 to 3.6 in 2002.

3.1. Temporal trends in suicide rates

The suicide rate for men aged 15 years and over increased up until 1985 and then decreased in the subsequent years, and the decrease was more evident after 1997. For women aged 15 years and over, the suicide mortality trend decreased smoothly starting from in the mid-1980’s (Fig. 1). In 1980, the suicide rate for men ranged from 5.3 in those aged 15–24 years to 32.4 in those aged 65 years and over; for women, it ranged from 2.3 in the youngest age group to 10.5 in the oldest. For both sexes, the ratio of the suicide rates of the oldest and the youngest age classes (65+/15–24) reached a peak in the mid-1980s and declined thereafter. For men, the ratio reached a peak in 1984 of 8.1 and declined to a value of 3.8 in 2002. For women, the ratio rose to a maximum of 9.3 in 1985 and declined thereafter to 4.0 in 2002. In recent years, therefore, one out of every five suicides for both sexes was a young person.

A more detailed analysis of the suicide rates by gender and age group is shown in Figs. 2 and 3. For those aged 45–64 and 65+, the suicide rates peaked in 1985, declining thereafter, and the estimated APCs from 1985 to 2002 were statistically significant for both genders. For those aged 45–64 years, a small decrease from 1985 was observed. For men aged 25–44 years, the suicide rate increased until 1994 (with a statistically significant APC) and decreased in the period 1994–2002, among women of the same age, the rate decreased steadily.
throughout the entire study period. For the youngest age class (15–24 years), a reduction was observed, starting from 1997 for both sexes; the significant decline for men was preceded by a slow but significant increase during the period 1988–1996.

The different patterns observed by age and sex indicate that the decrease in the overall mortality rates for suicide in Italy from 1985 to 2002 was due initially to the decrease observed in those aged 45–64 and 65+, while the subsequent decrease observed from 1997 was attributable principally to a reduction in mortality rates among the younger age classes.

3.2. The analysis of methods for suicide

The analysis of methods of suicide for the whole study period showed statistically significant differences by age for both sexes ($\chi^2 = 3307.0; df = 27; P < 0.001$ for men and $\chi^2 = 1599.4; df = 27$).
For men, the most frequent methods for suicide were hanging, firearms, jumping from a high place and poisoning by carbon monoxide. The least frequent method for men was poisoning by drugs. For men aged 65 and over, the frequency of suicide by jumping from a high place was higher than that observed in younger men, while poisoning by carbon monoxide and jumping/lying before a moving object (such as jumping in front of a train or subway train) were more frequent in the younger age groups. The percentage using

![Graph showing suicide mortality in Italy.](image)

**Table 2** Percentage distribution of suicides by method, gender, and age group.

<table>
<thead>
<tr>
<th>Method</th>
<th>Men 15–24 years</th>
<th>25–44 years</th>
<th>45–64 years</th>
<th>65 year and over</th>
<th>Total (15 years and over)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hanging</td>
<td>40.9</td>
<td>41.5</td>
<td>45.7</td>
<td>43.1</td>
<td>43.3</td>
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<tr>
<td>Firearms</td>
<td>21.7</td>
<td>17.2</td>
<td>19.2</td>
<td>17.8</td>
<td>18.4</td>
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<tr>
<td>Jumping from a high place</td>
<td>15.5</td>
<td>14.3</td>
<td>13.6</td>
<td>22.8</td>
<td>17.1</td>
</tr>
<tr>
<td>Poisoning by carbon monoxide</td>
<td>9.2</td>
<td>11.5</td>
<td>5.0</td>
<td>1.5</td>
<td>5.9</td>
</tr>
<tr>
<td>Poisoning by drugs</td>
<td>0.9</td>
<td>1.4</td>
<td>1.0</td>
<td>0.7</td>
<td>1.0</td>
</tr>
<tr>
<td>Poisoning by others substances</td>
<td>2.3</td>
<td>3.2</td>
<td>3.4</td>
<td>2.7</td>
<td>3.0</td>
</tr>
<tr>
<td>Drowning</td>
<td>3.5</td>
<td>4.4</td>
<td>6.4</td>
<td>6.4</td>
<td>5.7</td>
</tr>
<tr>
<td>Jumping/lying before moving object</td>
<td>4.0</td>
<td>3.5</td>
<td>2.7</td>
<td>1.8</td>
<td>2.7</td>
</tr>
<tr>
<td>Cutting and piercing</td>
<td>1.0</td>
<td>1.5</td>
<td>2.1</td>
<td>2.1</td>
<td>1.8</td>
</tr>
<tr>
<td>Others and late effects of self-inflicted injury</td>
<td>1.1</td>
<td>1.2</td>
<td>0.9</td>
<td>1.1</td>
<td>1.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method</th>
<th>Women 15–24 years</th>
<th>25–44 years</th>
<th>45–64 years</th>
<th>65 year and over</th>
<th>Total (15 years and over)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hanging</td>
<td>25.7</td>
<td>23.9</td>
<td>27.4</td>
<td>24.9</td>
<td>25.6</td>
</tr>
<tr>
<td>Firearms</td>
<td>11.4</td>
<td>5.8</td>
<td>2.4</td>
<td>0.7</td>
<td>3.1</td>
</tr>
<tr>
<td>Jumping from a high place</td>
<td>38.5</td>
<td>37.0</td>
<td>35.4</td>
<td>45.3</td>
<td>39.6</td>
</tr>
<tr>
<td>Poisoning by carbon monoxide</td>
<td>4.0</td>
<td>5.6</td>
<td>1.9</td>
<td>0.8</td>
<td>2.4</td>
</tr>
<tr>
<td>Poisoning by drugs</td>
<td>2.4</td>
<td>4.1</td>
<td>2.7</td>
<td>2.0</td>
<td>2.8</td>
</tr>
<tr>
<td>Poisoning by others substances</td>
<td>5.8</td>
<td>6.8</td>
<td>9.0</td>
<td>6.6</td>
<td>7.5</td>
</tr>
<tr>
<td>Drowning</td>
<td>5.8</td>
<td>10.1</td>
<td>15.0</td>
<td>14.4</td>
<td>13.2</td>
</tr>
<tr>
<td>Jumping/lying before moving object</td>
<td>3.8</td>
<td>4.1</td>
<td>3.0</td>
<td>2.0</td>
<td>2.9</td>
</tr>
<tr>
<td>Cutting and piercing</td>
<td>0.4</td>
<td>1.2</td>
<td>1.9</td>
<td>1.8</td>
<td>1.6</td>
</tr>
<tr>
<td>Others and late effects of self-inflicted injury</td>
<td>2.2</td>
<td>1.4</td>
<td>1.3</td>
<td>1.4</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Italian residents aged 15 year and over, years 1980–2002.

(*) Includes ICD9 code E959 ("late effects of self-inflicted injury") plus all the codes not included in the other categories.
drowning was particularly low among the younger men, and jumping/lying before a moving object, while rare, was more common among younger men.

For women, jumping from a high place was the most common method for suicide followed by hanging, submersion and poisoning by chemical substances. The least frequent method among women was self-injury by cutting. Suicide by firearms was the third most common method chosen by women aged 15–24 years, but it was rare among older women (the rarest method among elderly women). Poisoning by carbon monoxide was also more frequent among younger women, while drowning was more common among older women.

The methods chosen for suicide of the two sexes were more similar among 15–24-year-olds than for those of other ages. For men, the three most common methods of suicide were the same among all age classes: hanging, firearms and jumping from a high place. These were also the three most frequent methods among women aged 15–24 years, while the third most frequent method among older women was drowning (Table 2).

The analysis of temporal trends in suicide rates by each method for the period 1980–2002 showed that the decline observed in suicide rates was attributable mostly to certain methods (Figs. 4 and 5 and Table 3).

Suicide by hanging did not show significant changes during the study period, for either men or women. The stable trend of suicide by hanging for both sexes was a result of an increase among the younger age classes and a reduction among the older ones. Also, the significant reduction of mortality by jumping from a high place was mostly attributable to older people for both sexes, while a significant increase of suicide by jumping was observed among men aged 15–24 years. In contrast, the reduction in the suicide rate by drowning was significant for all age groups, but it was most noticeable among younger age groups. Regarding the suicide rate by firearms, a significant decrease was detected for men only among those aged 25–44 years and 45–64 years; for women, the overall suicide rate by firearms declined significantly from 1980 to 2002, and the reduction was almost entirely attributable to 25–44 year-olds. The rate of suicide by jumping/lying before a moving object did not show a significant trend for either sex but, for men, this was the result of an increase for younger age groups (significant for 15–24 years old) and a decrease for older age groups (significant for 45–64 years old). Suicide mortality by poisoning, by drugs and by chemical substances decreased significantly from 1980 to 2002, and the reduction was significant for each age group for both sexes. Also, the rate of suicide by cutting and piercing declined significantly during the study period: for women the rate decreased significantly in each age class, while for men the reduction was attributable mostly to the elderly. Finally, suicides by carbon monoxide increased over the time period, but the observed increase was statistically significant only among men aged 45–64 years.

In summary, the more lethal methods (including hanging for both genders and jumping from a height for men) became relatively more common by the end of the study period, especially among younger people.

3.3. The phenomenon of accidental deaths

Considering selected accidental deaths (see Table 1), 1290 deaths were recorded for men aged 15 and over in the year 2002 and 550 among women. The mortality rate for this group of causes in 2002 (5.1 for men and 1.9 for women) was about two-thirds lower than that observed in 1980 (15.8 for men and 5.5 for women) (Fig. 6). The sex ratio was lower than that for suicide (men/women=2.7 in 2002).

A further analysis indicated that the accident mortality rate decreased during the whole study period, with an estimated AAPC of $-5.1\%$ (95% CI: $-5.6$ to $-4.7$) among men and $-5.2\%$ (95% CI: $-6.0$ to $-4.3$) among women (two joinpoints were detected in 1985 and 1991 for men and one in 1995 for women). Furthermore, the ratio
of accidents/suicides for comparable causes (see Table 1) declined during the study period from 1.4 in 1980 to 0.5 in 2002 for men and from 1.1 to 0.7 for women.

Considering the entire study period, the geographical variability of mortality for accidents that might mask suicides showed the same gradient as did suicides: higher mortality level in the North and Center

**Table 3** Suicides by method, gender and age group, AAPC (95% CI), years 1980–2002.

<table>
<thead>
<tr>
<th>Method</th>
<th>Men</th>
<th>15–24 years</th>
<th>25–44 years</th>
<th>45–64 years</th>
<th>65 year and over</th>
<th>Total (15 years and over)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hanging</td>
<td>E953</td>
<td>+1.5 (−0.4; +3.4)</td>
<td>+2.0 (−1.5; +2.4)</td>
<td>−0.7 (−1.2; −0.3)</td>
<td>−1.0 (−3.2; +1.3)</td>
<td>+0.1 (−1.2; +1.5)</td>
</tr>
<tr>
<td>Firearms</td>
<td>E955</td>
<td>−2.1 (−5.9; +2.0)</td>
<td>−1.4 (−2.0; −0.8)</td>
<td>−1.4 (−2.7; −0.1)</td>
<td>−0.4 (−1.0; +0.2)</td>
<td>−0.9 (−2.8; +1.1)</td>
</tr>
<tr>
<td>Jumping from a high place</td>
<td>E957</td>
<td>+3.0 (−1.9; +4.1)</td>
<td>+1.0 (−0.2; +1.3)</td>
<td>−1.2 (−2.7; +0.3)</td>
<td>−2.7 (−3.8; −1.6)</td>
<td>−1.0 (−2.0; −0.1)</td>
</tr>
<tr>
<td>Poisoning by carbon monoxide</td>
<td>E952.0−E952.1</td>
<td>+2.9 (−1.7; +7.6)</td>
<td>+6.2 (−2.9; +9.7)</td>
<td>+4.2 (0.0; +8.6)</td>
<td>+3.2 (−1.5; +8.2)</td>
<td></td>
</tr>
<tr>
<td>Poisoning by drugs</td>
<td>E950.0−E950.5</td>
<td>−4.7 (−6.8; −2.6)</td>
<td>−4.6 (−6.6; −2.4)</td>
<td>−4.8 (−7.2; −2.5)</td>
<td>−4.8 (−6.4; −3.3)</td>
<td></td>
</tr>
<tr>
<td>Poisoning by other substances</td>
<td>E956.0−E951.9; E952.8</td>
<td>−3.0 (−5.3; −0.0)</td>
<td>−4.0 (−5.3; −2.7)</td>
<td>−4.5 (−5.8; −3.2)</td>
<td>−3.5 (−4.8; −2.3)</td>
<td>−4.5 (−6.0; −2.9)</td>
</tr>
<tr>
<td>Drowning</td>
<td>E954</td>
<td>−4.5 (−6.2; −2.9)</td>
<td>−3.9 (−6.1; −1.6)</td>
<td>−3.5 (−4.5; −2.4)</td>
<td>−3.7 (−6.7; −0.7)</td>
<td>−3.8 (−5.3; −2.3)</td>
</tr>
<tr>
<td>Jumping/lying before moving object</td>
<td>E958.0</td>
<td>+6.5 (−3.6; +9.5)</td>
<td>+0.8 (−0.6; +2.3)</td>
<td>−1.2 (−2.2; −0.2)</td>
<td>−1.4 (−2.8; +0.0)</td>
<td>+0.3 (−0.4; +1.1)</td>
</tr>
<tr>
<td>Cutting and piercing</td>
<td>E956</td>
<td>−3.0 (−7.8; +2.1)</td>
<td>−2.2 (−4.5; +0.2)</td>
<td>−3.3 (−5.3; −1.3)</td>
<td>−2.0 (−3.7; −0.3)</td>
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</tbody>
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<table>
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<tr>
<th>Method</th>
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<th>Total (15 years and over)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hanging</td>
<td>E953</td>
<td>+2.4 (−0.8; +4.0)</td>
<td>+1.5 (−0.7; +2.4)</td>
<td>−2.1 (−4.9; +0.7)</td>
<td>−1.3 (−2.1; −0.6)</td>
<td>−0.9 (−3.0; +1.3)</td>
</tr>
<tr>
<td>Firearms</td>
<td>E955</td>
<td>−0.1 (−1.8; +1.7)</td>
<td>−3.2 (−4.7; −1.8)</td>
<td>−1.7 (−3.8; +0.5)</td>
<td>+0.6 (−3.2; +4.5)</td>
<td>−2.1 (−3.0; −1.2)</td>
</tr>
<tr>
<td>Jumping from a high place</td>
<td>E957</td>
<td>−0.5 (−1.7; +0.7)</td>
<td>−0.5 (−2.1; +1.1)</td>
<td>−1.5 (−2.9; −0.2)</td>
<td>−2.9 (−3.8; −2.1)</td>
<td>−1.8 (−2.5; +1.2)</td>
</tr>
<tr>
<td>Poisoning by carbon monoxide</td>
<td>E952.0−E952.1</td>
<td>+2.3 (−2.5; +7.3)</td>
<td>+2.4 (−0.2; +5.1)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Poisoning by drugs</td>
<td>E950.0−E950.5</td>
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<td>−2.0 (−3.7; −0.3)</td>
<td>−4.1 (−6.8; −1.4)</td>
<td>−3.8 (−5.6; −2.0)</td>
<td></td>
</tr>
<tr>
<td>Poisoning by other substances</td>
<td>E956.0−E951.9; E952.8</td>
<td>−7.6 (−8.8; −6.4)</td>
<td>−6.9 (−7.8; −5.9)</td>
<td>−3.6 (−5.0; −2.2)</td>
<td>−6.0 (−6.6; −5.3)</td>
<td></td>
</tr>
<tr>
<td>Drowning</td>
<td>E954</td>
<td>−6.3 (−7.5; +5.0)</td>
<td>−4.7 (−5.4; −3.9)</td>
<td>−3.3 (−4.8; −1.7)</td>
<td>−4.4 (−5.6; −3.3)</td>
<td></td>
</tr>
<tr>
<td>Jumping/lying before moving object</td>
<td>E958.0</td>
<td>−0.7 (−2.8; +1.4)</td>
<td>−1.2 (−3.0; +0.6)</td>
<td>−0.6 (−3.0; +1.9)</td>
<td>−0.6 (−1.9; +0.7)</td>
<td></td>
</tr>
<tr>
<td>Cutting and piercing</td>
<td>E956</td>
<td>−4.3 (−6.8; −1.8)</td>
<td>−2.8 (−5.2; −0.4)</td>
<td>−3.5 (−5.0; −2.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others and late effects of self-inflicted injury</td>
<td>E956</td>
<td>−3.1 (−5.1; −1.1)</td>
<td>−2.9 (−5.4; −0.4)</td>
<td>−2.6 (−3.9; −1.3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Italian residents aged 15 year and over.

(*) Includes ICD9 code E959 (”late effects of self-inflicted injury”) plus all the codes not included in the other categories.

**Fig. 5.** Suicide mortality by method. Age-adjusted rates (symbols) and estimated trends (straight lines) [joinpoint analysis]. Women aged 15 years and over. Italy, years 1980–2002.
as compared with the South for both genders (Table 4). For men, mortality from “accidents” was 41% higher in North Italy and 15% higher in Central Italy as compared with the South, about the same magnitude of differences as observed for suicide mortality (46% and 17% higher in North and Center, respectively).

For women, the geographical variability of “accidental” mortality was wider than that observed for suicide: +76% for “accidents” versus +57% for suicide in the North as compared to the South, and +50% versus +25% in the Center.

3.3.1. “Undetermined” deaths by poisoning

Regarding “undetermined” deaths by poisoning in the year 2002 among Italians aged 15 years and over, only 28 deaths were recorded among men and 16 among women (which accounted for about 6% of all “undetermined” deaths for both sexes), with a standardized rate of 0.11 and 0.06, respectively. A significant increase in mortality rates was detected from 1980 to 1986 both for men (APC: +27.5%; 95% CI: +1.9 to +59.6) and for women (APC: +25.7%; 95% CI: +1.7 to +55.4), but changes observed after 1986 were not significant either for men (APC: +2.5%; 95% CI: −0.01 to +5.2) or for women (APC: −0.19%; 95% CI: −3.35 to +3.06).

4. Discussion

In Italy, there was a decline in the suicide rates of men and women from 1980 to 2002 of 11% and 44%, respectively. This figure is of the same order of magnitude as that reported in the European Union from 1980–1984 to 1995–1998 for men (−10.6%), but higher than that reported for women (−29.2%) (Levi et al., 2003). In 2002 the suicide rates for men and women were 10.2 and 2.8, respectively, placing Italy among the countries at low risk for suicide (Bertolote and Fleischmann, 2005). This decline is possibly a result of changes in risk factors such as the incidence and treatment of psychiatric disorders and changes in psychological, economic and social factors. It is noteworthy in this regard that Italy has implemented an integrated and community-based mental health system, and it is one of the countries with a low prevalence of mental disorders (De Girolamo and Cozza, 2000; Burti, 2001; Demyttenaere et al., 2004). Moreover, in a cross-sectional survey of the prevalence and correlates of suicidal ideation and attempts in the general population of Europe, Italy showed the lowest rates of suicidality (Bernal et al., 2007).

The hypothesis that a systematic and substantial underreporting of suicide could explain, at least in part, the temporal trend seems to be unlikely because the accidental death rates in men and women observed in Italy in the same period indicated a consistent decrease. Furthermore, “undetermined” deaths by poisoning (among which previous studies have found a high percentage of misclassified suicides) are very rare in Italy and did not show a detectable increase (Allebeck et al., 1991; Ohberg and Lonnqvist, 1998; Lindqvist and Gustafsson, 2002; Donaldson et al., 2006). Therefore, the changes detected in the temporal trend of suicide in Italy are likely to be real, and they cannot be attributed to a compensatory exchange between causes of death (suicide versus accidents). Misclassification undoubtedly occurs, and the very similar pattern of geographical variability in “accident” mortality as compared with suicide mortality supports the hypothesis of an under-reporting of suicides as a result of mislocation of suicide to “accidental” deaths, but the under-reporting does not seem to bias either the geographical distribution or the temporal trend. In other words, the suicide mortality, as collected by ISTAT,
could possibly be an underestimate, but it has not been proved to be biased. This result confirms the findings of previous research (e.g., Kreitman, 1976), and it is also supported by the temporal trend of "undetermined" deaths by poisoning.

The geographical analysis showed that the suicide rate is lower in the South-Islands than in the Center and North, consistent with previous studies (Ceccherini, 1989; Crepet et al., 1991; Preti, 1998; Pavia et al., 2005). The lower level of suicidality in the South of Italy as compared with the Northern and Central regions is probably not a result of the under-reporting of suicides because a very similar geographical pattern was observed for accidental deaths.

Previous studies carried out in Italy reported a substantial rise in suicide mortality in younger men until 1996 (D’Avanzo et al., 1993; Guiana et al., 2002) but, in the present study, the data showed a decrease from 1997 on; and our results are in accordance with recent findings on the reduction of suicide rates among the young in Western countries (Biddle et al., 2008; Morrell et al., 2007;Stark et al., 2008; Vannik et al., 2009). Moreover, our results are in accord with findings reported by De Leo et al. (1997) regarding suicide rates in the age class 65+ for the period of 1980–1993.

The change in the methods for suicide in men and women from 1980 to 2002 indicated that the highly lethal methods for suicide, such as hanging, became relatively more common in both men and women. The increase of suicide by hanging among the younger age groups reported in this study is consistent with that observed in England and Wales and other countries (Gunnell et al., 2003; Starkviiene et al., 2006). Hinging has become a leading method of suicide in many countries that vary greatly in terms of cultural and social features (De Leo et al., 2002). Hanging is a particularly lethal method of suicide (an estimated fatality rate of about 70% has been reported) since the death occurs in a few minutes from asphyxia, and rescue procedures are unlikely to be effective (Aufferheide et al., 1994; Gunnell et al., 2005).

The comparison of suicide trends by methods in Italy that has been presented here suggests that if switching between methods (more lethal versus less lethal ones) occurred (and this probably occurred among young people), it did not compensate completely for the reduction in less lethal methods. It could be that people who want to self-destruct, but who do not succeed in this goal the first time, will try again (probably with a more lethal method). However, it could also be that the failed attempt brings about catharsis, leading to profound psychological changes and/or it alerts the public mental health services and the relationship/kinship network (if it exists and is really supportive), thereby preventing a second suicide attempt (Walker et al., 2001). From the point of view of this second hypothesis, any public policy that reduces the availability and/or lethality of methods for suicide could save many lives. However, reduced availability is not possible for hanging except for psychiatric inpatients and prisoners.


